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In addition to the above-mentioned enterprises, it may well be desirable to establish a paper mill as soon as there is an assured supply of pulp from abroad. As the demand for paper bagging for domestically produced fertilizers and cement increases, it will probably be more economical to produce such paper in Iraq than to import it. A plant for the manufacture of glass bottles, other containers and tumblers might also be started, provided the availability of the right type of sand can be confirmed.

The largest and perhaps the most promising industrial possibility lies in the utilization of the natural gas produced in conjunction with oil and now almost totally wasted. The Mission recommends therefore that early consideration be given to the erection, near Kirkuk, of a plant which, using natural gas and gypsum as raw materials, would be capable of producing annually 500,000 tons of ammonium sulphate fertilizer, 100,000 tons of elemental sulphur, 10,000 tons of carbon black and 300,000 tons of cement. Since the natural gas contains about 10.5 percent of hydrogen sulphide by volume, it would be worthwhile to establish a plant to recover sulphur from all of the gas produced. Part of the cleaned gas would then be cracked thermally, producing hydrogen after removal of the carbon black. In the most important part of the plant the hydrogen and nitrogen won by removing carbon monoxide and carbon dioxide from the flue gases would be synthesized under high pressure into ammonia. Ammonia and carbon dioxide would then be passed through a slurry of finely ground gypsum, yielding calcium carbonate and ammonium sulphate. The latter would be sold as fertilizer and the former used to make cement. Such a plant could produce fertilizer very cheaply, thereby stimulating its use in Iraq; and any fertilizer not consumed domestically would find a ready market abroad. Sulphur and carbon black could be used in the production of rubber tires in Iraq and would also be in great demand abroad; and there will undoubtedly be a growing demand for cement in Iraq. The plant would cost aproximately ID 25,000,000, of which the sulphur recovery plant would account for about ID 8,750,000 and the cement plant for ID 1,500,000. It should be attempted only if a reliable foreign chemical concern can be interested in designing and erecting it and undertaking its operation under a management contract.

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388 from the seeds of agricultural crops such as cotton, sesame and linseed. The linseed oil is blended and used in the making of paint, while the sesame and cotton seed oils are purified and distilled into light and heavy fractions, the light fractions being used as an edible oil, while the heavier are retained for soap-making. Although the expellers have a combined capacity of 20 tons of seed per day, the plant fails to satisfy present needs. Capacity should be increased by the installation of two additional mechanical expellers and a single solvent extraction unit to serve the entire plant. A washing plant should be installed for the purpose of reducing maintenance on the expellers. In addition to extending the capacity of the present facilities, new equipment is needed for the hydrogenation of oil for cooking fats.

Operating in conjunction with the oil plant is a soap plant with a capacity of 7.5 tons of laundry soap and 2.5 tons of toilet soap per day. This is estimated to be less than one third of present requirements. These facilities should be increased to take care of at least one half of the country's needs.

In all, the expansion program would cost an estimated ID 600,000, including ID 500,000 in foreign exchange, mostly in pounds sterling. It would probably require approximately two years before all of the facilities could be put into operation. Employment would be increased by approximately 60 workers.

Cement

339 Iraq's new cement plant is one of the more important projects sponsored by the Industrial Bank. The market for cement is expanding at a rapid rate and is well beyond the present plant's capacity of 220 tons per day. Additional equipment now scheduled for operation in 1952 will double the plant's output. Even so, production will fall short of domestic requirements. The larger plant should, however, reduce production costs and the cheaper cement should in turn open up many new markets in the construction and transport fields.

Brick and Tile

Brick is the prime building material. Over 30 private factories are engaged in the manufacture of bricks, and even though most of the plants are very antiquated, production costs are very rea-

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sonable. However, the quality of the brick, because of the type of clay available, is rather poor. The demand for brick is easily met by the present highly competitive industry. When, however, the cement plant is enlarged, it will tend to replace brick by offering better and cheaper material in such forms as concrete blocks. In view of this, there does not appear to be any justification for enlarging the brick industry.

At present, some tile is made, but it, too, is being replaced by cement.

Milling

Iraq possesses three fairly large flour mills. The older ones are now being modernized with the latest machinery. A very modern mill was recently constructed at Basra, with a capacity of 50 tons per day, for the purpose of making possible the exportation of flour rather than just wheat. So far, a shortage of grain has prevented the mill from operating as planned. When a sufficient supply of grain becomes available, however, the mill will be capable of serving the export market in addition to local requirements.

Aluminumware

Aluminumware is very popular. It is now being manufactured in a small plant in Baghdad from imported sheet, which represents more than 70 percent of the production cost of the finished article. Production is limited to about 480 tons per year because of the difficulty in getting aluminum; however, even with an ample supply of material, the present capacity of the plant (600 tons) is only sufficient to meet about one third of the country's requirements. Production costs could be greatly reduced, first, by increasing the capacity of the plant, and second, by installing facilities permitting the utilization of both scrap aluminum and pig. To double the plant's capacity and install equipment to melt and roll scrap and pig would cost approximately ID 200,000, of which ID 175,000 would be foreign exchange, mainly in pounds sterling. These new facilities would require about two years to construct and, when finished, would employ approximately 40 additional workers.

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working shops, battery and electrical repair work, shops for repair of automotive and agricultural equipment, bakeries, confectioneries and food processing establishments of various kinds. The amount of capital required in individual cases is quite small but, in the aggregate, it adds up to a considerable sum. The Industrial Bank should arrange for a small-enterprise section to make surveys of small industries in each community, advise them concerning ways of improving their methods of production and assist in getting proper financial help where it is justified. It is estimated that ID 400,000 would be sufficient to meet the needs of these industries over the next five years.

The assistance of small industries by the Industrial Bank is to be preferred to assistance or stimulation of so-called cottage industries. Cottage industries may be of benefit in the over-populated areas of Asia, but for Iraq they do not appear to be an appropriate solution to industrial growth. Iraq's population is small in relation to the resources available. Over the long term its problem is not primarily one of creating a maximum number of jobs with a minimum of capital but rather one of utilizing capital resources in ways which will make a permanent addition to the productive capacity of the country and to the building of modern industrial enterprises.

Establishment of New Industries

The entrance of industry into new fields would help to balance the over-all development of the country and to utilize its resources more fully. At the same time it would increase employment and thereby aid in raising the general standard of living.

Nitrate Fertilizer, Sulphur and Cement Plant

The largest and perhaps most promising possibility for new industrial development lies in the utilization of the natural gas produced in conjunction with oil. Upon completion of the 30-inch pipeline, oil production at the Kirkuk field will be at a rate which will make more than 25 billion cu. ft. of gas available per year. For the most part, this gas will be wasted until some means is found for its economic utilization. This gas contains, according

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ing the first years of operation. Such a mill would give permanent employment to approximately 50 workers.

Concrete Batching Plant

Iraq will probably undertake in the near future a considerable number of construction projects for which poured concrete would appear to be the best material. It would therefore be desirable to locate in Baghdad a batching plant with ready-mix trucks to furnish the concrete. Standard steel forms would also be needed. A batching plant capable of producing cement for approximately 5,000 houses per year would cost about ID 125,000 in foreign exchange, mostly U. S. dollars. It could be financed by private capital with the assistance of the Industrial Bank.

Glass Works

During the war, two plants at Mosul remelted broken glass to make glass tumblers, etc. These plants are now closed as they are no longer competitive with imported glass.

It has been stated that suitable sand for glass manufacture has been located near Mosul. If the Department of Industries verifies the adequacy and suitability of this sand, then a new glass factory might well be constructed to make bottles, white containers and tumblers for domestic consumption. No attempt, however, should be made to manufacture flat glass. No recommendation is made in regard to the construction of such a plant, however, until adequate sources of material are proven.

Date Packing Crates

The cost of wooden boxes for the shipping of dates has steadily increased and represents a considerable cost to the date industry. At present, the practice is to import the boxes in pieces for assembly in Iraq. It is recommended that a small box plant be constructed at Basra to make these boxes from imported timber. This factory would require only a few power-driven wood-working tools estimated to cost ID 10,000, primarily in pounds sterling, and should reduce the cost of date boxes by at least 50 percent. The plant could be financed by private capital and sponsored by the Date Association. It would employ about 30 full-time workers.

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port traffic and such associated activities as the packing of dates, cleaning of barley and flour-milling (a new industry), Basra is closely bound up with the development of the new oil field at Zubair, some 10 miles inland. Basra, like Baghdad, received a large influx of people during the war, especially from nearby Amara.

The population of Kirkuk, the fourth city, is believed to have tripled in the last 25 years as a consequence of the development of Iraq's major oil field. The two holy cities in Kerbela province, Kerbela and Nejf, have a large transient population due to pilgrim traffic from Iran and other Moslem countries. These two cities have many handicraft workers in such trades as jewelry, brasswork and embroidery.

These six cities, together with Amara, are the only ones with a population of over 40,000. With a few exceptions, such as Khanaqin with its small oil field and refinery, the other municipalities function primarily as centers of administration and trade for surrounding districts. Broadly speaking, their size varies with their administrative importance. Of the provincial capitals, other than those already mentioned, five have a population between 20,000 and 40,000 and three between 10,000 and 20,000. Of the remaining municipalities, none has a population exceeding 20,000; less than 30, most of them centers of *qadhas*, have a population of more than 6,000.

Despite differences in size and function, the cities and towns have a number of characteristics in common. The older parts are usually congested with narrow streets and alleys. Houses are built around courtyards, the only opening to the street being the main doorway. The houses usually have a flat roof or a partially open second story for sleeping outside in the summer. Brick is the commonest building material; most of the larger towns have brickworks nearby, many of which are small and primitive. There are also a few modern concrete and steel buildings, mainly in Baghdad. Schools and hospitals can be found in the heart of these congested areas. An important section in every city is the *Suq* or bazaar, a network of alleys, often covered by crude roofs forming a series of arcades. These alleys are lined with the small shops of retail merchants and handicraft workers in textiles and metals. The *Suq* is usually located near the principal mosque.

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Labor and Materials

The Housing Authority could also take the lead in improving the quality of labor and materials in order to bring the costs of building down. In this task, it should cooperate with the Ministry of Education in reorganizing training methods. It could also advise the Industrial Bank on desirable types of specifications of building materials and should estimate probable requirements so that the Bank could initiate investment to this end in partnership with private enterprise.

The materials produced locally for housing construction are on the whole inferior and expensive. For example, a casual inspection of house construction in the cities will reveal that unevenly burnt bricks with cracks and chipped-off edges and corners have been and are being used. To remedy the shortage of good building materials, foreign goods have been imported at high cost. In the case of the IPC housing project, it was estimated that the cost of imported steel window and door sashes alone amounted to as much as 20 percent of the cost of the structures.

The inferiority of building materials is matched by the poor quality of building labor, which again adds to the cost of construction. There is urgent need for good carpenters, masons, plumbers, electricians and painters. Unfortunately, attempts to improve skills through vocational schools have not been altogether successful. The schools lack competent instructors, a number of those teaching in Baghdad, for example, being illiterate. Workshop accommodations are restricted and the equipment is out-of-date or in bad condition. These deficiencies might be overcome by importing instructors from neighboring countries, by obtaining new equipment and by running evening classes until more laboratory space is available. This is not, however, the full answer. Graduates from vocational schools tend to prefer desk jobs to field work. It would be preferable to concentrate more on training schemes on the job under good supervision.

Government Housing

The Ministry of Social Affairs is empowered by Law No. 38 of 1941 and Law No. 22 of 1945 to "construct dwellings for

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874 ics in agricultural areas. Foreign advisers and instructors are being extensively employed. *Commercial:* secondary commercial schools in Baghdad, Mosul, Najaf, with night classes in Baghdad and Najaf. Commercial classes have been introduced into the ordinary secondary school curriculum in various cities. *Nursing and Domestic Science:* Schools of Domestic Science, Nursing, Midwifery in Baghdad. It has been proposed that instruction in the state vocational schools should be of such a standard that graduates could proceed at once to the relevant higher institutions. Other vocational establishments are the Iraq State Railways workshop training school in Baghdad and the IPC's technical training centre in Kirkuk.

873 An Institute of Fine Arts in Baghdad gives instruction in music, painting, sculpture, and drama and trains teachers in most of these subjects.

873 217 *Department of Antiquities.* The Department of Antiquities maintains an extensive programme of excavation, restoration, research and publication and has gained recognition for its work in international academic circles. It controls five museums in Baghdad, one each at Samarra and Babylon, and has recently opened one in Mosul.

Economic Survey

651 439 433 The greater part of Iraq's national revenue will soon be drawn from her oil, which represents an important fraction of the world's supply. Her general economic organization is nevertheless agronomic. Agriculture and animal husbandry practically suffice for her internal requirements of foodstuffs and provide, after oil, most of her exports.

135 Apart from oil, raw materials are sparse. There are deposits of salt, low-grade bituminous coal, gypsum, and sulphur and, in more limited quantities, of potassium nitrate, crystal quartz, sandstone, and dolomite. Building stone is found only in the hill districts; in the alluvial plain mud and reeds are the common building materials of the poor, but houses of locally made burnt bricks are common in the towns.

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185 652 [511] In 1950 a Development Board was established with the function of drawing up and, after parliamentary approval, executing a general economic and financial plan for developing the country's resources and raising the standard of living; it was to include but not be limited to projects for water conservancy, flood control, irrigation, drainage, industry, mining, and improvement of river, land, and air communications. For the execution of its programme the Board has been allocated 70 per